

Name \_\_\_\_\_

## Mutations

There are several types of mutations:

- **SUBSTITUTION** (one base is replaced with another)
  - If a substitution *changes one* amino acid, it's called a **MISSENSE** mutation.
  - If a substitution *changes the amino acid to a "stop,"* it's called a **NONSENSE** mutation.
  - If a substitution *does not change* the amino acid, it's called a **SILENT** mutation.
- **DELETION** (a base is removed)
- **INSERTION** (an extra base is added)
  - Deletion and insertion may cause what's called a **FRAMESHIFT** mutation, meaning the reading "frame" changes, changing the amino acid sequence.
  - If bases are inserted or deleted in multiples of **3**, the reading frame is not changed

For Example:

Original sentence: THE BOY SAW THE RED RAT RUN.

Substitutions:

- Missense: THE BOY SAW THE RED CAT RUN.
- Nonsense: THE BOY SAW THE.
- Silent: THE BOY SAW THE RED RAT RUN.

Frameshift Mutations resulting from:

- Deletion: THE BOS AWT HER EDR ATR UN
- Insertion: THE ABO YSA WTH ERE DRA TRU N

No Frameshift Mutations resulting from:

- Deletion: THE BOY SAW THE RAT RUN.
- Insertion: THE BOY SAW THE FAT RED RAT RUN.

Now you try. Complete the boxes on the next page.

In the first box:

1. **Count** the number of bases in the original DNA sequence and record in the box provided
2. **Transcribe** the original DNA sequence into mRNA codons
3. **Translate** the mRNA into its amino acid sequence using your decoder

In the remaining 5 boxes which contain mutated DNA sequences:

1. **Count** the number of bases in the mutated DNA sequence and record in the box provided
2. **Transcribe** the mutated DNA sequence into mRNA codons
3. **Translate** the resulting mRNA into its amino acid sequence using your decoder
4. **Classify** each mutation as a *Substitution*, *Deletion*, or *Insertion* based on how the number of bases in DNA were affected compared to the original sequence
5. Then further **classify** each mutation as either *missense*, *nonsense*, *silent*, or *frameshift* based on how the amino acids were affected compared to the original sequence

**Original DNA Sequence:** T A C A C C T T G G C G A C G A C T

**mRNA Sequence:** \_\_\_\_\_

**Amino Acid Sequence:** \_\_\_\_\_

# of bases  
in DNA =  
\_\_\_\_\_

**Mutated DNA Sequence #1:** T A C A T C T T G G C G A C G A C T

What's the mRNA sequence? \_\_\_\_\_

What will be the amino acid sequence? \_\_\_\_\_

What kind of mutation is this? \_\_\_\_\_ AND \_\_\_\_\_

# of bases  
in DNA =  
\_\_\_\_\_

**Mutated DNA Sequence #2:** T A C G A C C T T G G C G A C G A C T

What's the mRNA sequence? \_\_\_\_\_

What will be the amino acid sequence? \_\_\_\_\_

What kind of mutation is this? \_\_\_\_\_ AND \_\_\_\_\_

# of bases  
in DNA =  
\_\_\_\_\_

**Mutated DNA Sequence #3:** T A C A C C T T A G C G A C G A C T

What's the mRNA sequence? \_\_\_\_\_

What will be the amino acid sequence? \_\_\_\_\_

What kind of mutation is this? \_\_\_\_\_ AND \_\_\_\_\_

# of bases  
in DNA =  
\_\_\_\_\_

**Mutated DNA Sequence #4:** T A C A C C T T G G C G A C C A C T

What's the mRNA sequence? \_\_\_\_\_

What will be the amino acid sequence? \_\_\_\_\_

What kind of mutation is this? \_\_\_\_\_ AND \_\_\_\_\_

# of bases  
in DNA =  
\_\_\_\_\_

**Mutated DNA Sequence #5:** T A C A C C T T G G G A C G A C T

What's the mRNA sequence? \_\_\_\_\_

What will be the amino acid sequence? \_\_\_\_\_

What kind of mutation is this? \_\_\_\_\_ AND \_\_\_\_\_

# of bases  
in DNA =  
\_\_\_\_\_